

REMARKS

Applicant respectfully requests reconsideration and allowance of the subject application. Claims 1-38 and 63-64 are canceled without prejudice. Claims 39-62 are pending in this application.

Objections to the Specification

The informalities noted in the February 25, 2005 Office Action have been corrected as suggested. Applicant respectfully requests that the objections to the specification be withdrawn.

35 U.S.C. § 102

Claims 29-62 stand rejected under 35 U.S.C. §102(b) as being unpatentable over U.S. Patent No. 6,552,744 to Chen (hereinafter "Chen"). Applicant respectfully submits that claims 29-62 are not anticipated by Chen.

Chen is directed to a virtual reality camera (see, Title). The virtual reality camera includes a sensor to detect the camera orientation at which images in a scene are captured (see, col. 2, lines 46-48). A computer within the virtual reality camera combines the images of the scene into a panoramic image based, at least partly, on the respective camera orientations at which the images were captured (see, col. 2, lines 48-51). A display in the virtual reality camera is used to view the panoramic image (see, col. 2, lines 51-52). The orientation of the virtual reality camera is used to select which portion of the panoramic image is displayed so that a user can effectively pan about the panoramic image by changing the orientation of the camera (see, col. 2, lines 52-57).

With respect to claim 39, claim 39 recites:

A method of rendering a view of a surrounding scene, the method comprising:
determining, for the view to be rendered, a viewing position representing a location of an observer that is observing the surrounding scene; and
for each pixel in an image to be rendered as a representation of the view of the surrounding scene,
determining a viewing ray passing through the pixel in a direction of viewing of the observer, and
selecting which of a plurality of longitudinally adjacent capture images is to be used to determine a display value for the pixel.

Applicant respectfully submits that no such method is disclosed by Chen.

In the method of claim 39, the determining and selecting is performed for each pixel in an image to be rendered. Thus, for each pixel, a viewing ray passing through the pixel in a direction of viewing of the observer is determined, and which of a plurality of longitudinally adjacent capture images is to be used to determine a display value for the pixel is selected. However, Applicant respectfully submits that no such pixel-by-pixel determination and selection is disclosed in Chen.

Chen refers generally to display of a panoramic image. Col. 3, lines 44-53 of Chen discusses such display, and reads as follows:

Still referring to FIG. 1, when a panoramic image (or other multiple-view image) is displayed on display 27, changes in camera orientation are detected via the O/P sensor 21 and interpreted by the processor 19 as requests to pan about the panoramic image. Thus, by rotating the VR camera 12 in different directions, a user can view different portions of the previously generated panoramic image on the display 27. The VR camera's display 27 becomes, in effect, a window into a virtual environment that has been created in the VR camera 12.

However, Chen does not provide any more description or discussion of how the portions of the panoramic image are determined – Chen does not include any details describing how the values for particular pixels of the display 27 are determined. There is no discussion or mention in Chen of determining, for each pixel in an image to be rendered, a viewing ray passing through the pixel. The general statement that a user can view different portions of a previously generated panoramic image on a display does not provide any discussion or mention of determining such viewing rays. Applicant respectfully submits that the general statement that a user can view different portions of a previously generated panoramic image on a display does not provide any specific details of how those different portions can be viewed, much less any description of the pixel-by-pixel determination and selection as recited in claim 39.

For at least these reasons, Applicant respectfully submits that claim 39 is not anticipated by Chen.

With respect to claims 40, 41, 43, 46-54, and 56-68, given that claims 40, 41, 43, 46-54, and 56-68 depend from claim 39, Applicant respectfully submits that claims 40, 41, 43, 46-54, and 56-68 are likewise allowable over Chen for at least the reasons discussed above with respect to claim 39.

With respect to claim 42, claim 42 depends from claim 39 and Applicant respectfully submits that claim 42 is allowable over Chen due to its dependency on claim 39. Furthermore, in the February 25, 2005 Office Action at p. 4, it was asserted that “zooming is mentioned as one of the movements that changes the position of the display and when the image is zoomed in on it is inherent that interpolation is used to create the image on the display and to determine the

display values". Applicant respectfully disagrees, and submits that Chen does not disclose interpolating, based on the plurality of longitudinal image arrays, to determine the display value for the pixel if more than one of the plurality of image arrays is used as recited in claim 42.

Under the principles of inherency, if a structure in the prior art necessarily functions in accordance with the limitations of a process or method claim of an application, the claim is anticipated (*In re King*, 801 F.2d 1324, 1326, 231 USPQ2d 136 (Fed. Cir. 1986)). Applicant respectfully submits that the virtual reality camera of Chen zooming does not necessarily perform interpolating, based on the plurality of longitudinal image arrays, to determine the display value for the pixel if more than one of the plurality of image arrays is used, as recited in claim 42. Zooming could potentially be performed in different ways in Chen. — Chen is silent as to how the zooming is actually performed. As such, Applicant respectfully submits that Chen does not necessarily function in accordance with the method of claim 42, and thus that the interpolating of claim 42 is not inherent in Chen.

Furthermore, there is no discussion or mention in Chen of interpolating, based on the plurality of longitudinal image arrays, to determine the display value for the pixel *if more than one of the plurality of image arrays is used* as recited in claim 42 (emphasis added). There is no discussion or mention in Chen of any interpolation decisions being made based on whether more than one of a plurality of image arrays is used. Although Chen mentions that zooming may be performed, there is no discussion or mention that the zooming involves interpolating if more than one of a plurality of image arrays is used. As there is no

discussion or mention of such a condition being placed on interpolation in Chen, Applicant respectfully submits that Chen does not disclose interpolating, based on the plurality of longitudinal image arrays, to determine the display value for the pixel if more than one of the plurality of image arrays is used as recited in claim 42.

For at least these reasons, Applicant respectfully submits that claim 42 is not anticipated by Chen.

With respect to claim 44, claim 44 depends from claim 39 and Applicant respectfully submits that claim 44 is allowable over Chen due to its dependency on claim 39. Furthermore, similar to the discussion above regarding claim 42, Applicant respectfully submits that Chen does not necessarily function in accordance with the method of claim 44, and thus that the interpolating of claim 44 is not inherent in Chen.

Furthermore, there is no discussion or mention in Chen of interpolating, based on the plurality of image columns, to determine the display value for the pixel *if more than one of the plurality of image columns is used* as recited in claim 44 (emphasis added). There is no discussion or mention in Chen of any interpolation decisions being made based on whether more than one of a plurality of image columns is used. Although Chen mentions that zooming may be performed, there is no discussion or mention the zooming involves interpolating if more than one of a plurality of image columns is used. As there is no discussion or mention of such a condition being placed on interpolation in Chen, Applicant respectfully submits that Chen does not disclose interpolating, based on the

plurality of image columns, to determine the display value for the pixel if more than one of the plurality of image columns is used as recited in claim 44.

For at least these reasons, Applicant respectfully submits that claim 44 is not anticipated by Chen.

With respect to claim 45, claim 45 depends from claim 39 and Applicant respectfully submits that claim 45 is allowable over Chen due to its dependency on claim 39. Furthermore, in the February 25, 2005 Office Action at p. 5, it was asserted that "It is inherent that Chen uses the angle between the viewing ray and the camera position is determined in order to show the correct portion of the scene that the observer is viewing". Applicant respectfully disagrees, and submits that Chen does not disclose calculating an angle between the viewing ray and a camera direction at the intersection point, and identifying the one or more of the plurality of image columns based on the calculated angle as recited in claim 45.

Applicant respectfully submits that the virtual reality camera of Chen allowing a user to view different portions of a previously generated panoramic image on a display does not necessarily perform the calculating and identifying of claim 45. Allowing a user to view the different portions could potentially be performed in different ways in Chen, and Chen is silent as to how the different portions are displayed. As such, Applicant respectfully submits that Chen does not necessarily function in accordance with the method of claim 45, and thus that the calculating and identifying of claim 45 is not inherent in Chen.

Furthermore, in Chen when a panoramic image (or other multiple-view image) is displayed, changes in camera orientation are detected via the O/P sensor 21 and interpreted by the processor as requests to pan about the panoramic image

(See, col. 3, lines 44-48). The orientation of the virtual reality camera is used to select which portion of the panoramic image is displayed so that a user can effectively pan about the panoramic image by changing the orientation of the camera (see, col. 2, lines 52-57). The O/P sensor 21 is used to detect the orientation (i.e., pitch, yaw and roll) of the camera (see, col. 3, lines 27-30). In the February 25, 2005 Office Action at p. 5, it was asserted that Chen discloses "calculating an angle between the viewing ray (observer's line of sight) and a camera direction at the intersection point; and identifying the one or more of the plurality of image columns based on the calculated angle (The O/P sensor (21) will determine the observer' orientation, which would include the observer's line of sight".

If the viewing ray were to be the observer's line of sight as asserted in the February 25, 2005 Office Action, and the orientation of the virtual reality camera is used to select which portion of the panoramic image is displayed, it is unclear why any angle between the observer's line of sight and the orientation of the camera would need to be calculated. The observer's line of sight and the orientation of the camera would always be the same, so there would be no need to calculate the angle in Chen, much less perform any sort of identification based on the calculated angle. Accordingly, Applicant respectfully submits that Chen does not disclose the calculating and identifying of claim 45.

For at least these reasons, Applicant respectfully submits that claim 45 is not anticipated by Chen.

With respect to claim 55, claim 55 depends from claim 39 and Applicant respectfully submits that claim 55 is allowable over Chen due to its dependency on

claim 39. Furthermore, in the February 25, 2005 Office Action at p. 10, it was asserted that "It is inherent that the method uses a two-body rigid object mode to describe motion of the eye pair since two different viewing angles are being used (col. 8, lines 61-67)". Applicant respectfully disagrees, and submits that Chen does not disclose using a two-body rigid object model to describe motion of the eye pair as recited in claim 55.

In Chen, a stereo display 127 is provided to allow a 3D view of a scene to be displayed (see, col. 8, lines 61-62). However, Applicant respectfully submits that the virtual reality camera of Chen including a stereo display to allow a 3D view of a scene to be displayed does not necessarily perform the using of claim 55. Allowing a 3D view of a scene to be displayed on a stereo display could potentially be performed in different ways in Chen, and Chen is silent as to how such a 3D view of a scene is displayed. As such, Applicant respectfully submits that Chen does not necessarily function in accordance with the method of claim 55, and thus that the using of claim 55 is not inherent in Chen.

With respect to claim 59, claim 59 recites:

One or more computer-readable media having stored thereon a computer program that, when executed by one or more processors of a computer, causes the one or more processors to perform acts including:

determining, for a view of a surrounding scene to be rendered, a viewing position representing a location of a point of view inside the scene, wherein the surrounding scene is defined by a capture cylinder including a plurality of longitudinal image arrays generated from a plurality of capture images; and

for each pixel in an image to be rendered as a representation of the view of the surrounding scene,

determining a viewing ray passing through the pixel in a direction of viewing corresponding to the view,

determining an intersection point between the viewing ray and the capture cylinder,

using the intersection point to determine which one or more of the plurality of longitudinal image arrays to use to determine the display value for the pixel,

determining, based on the intersection point, which one or more of a plurality of image columns in each of the one or more of the plurality of longitudinal image arrays to use to determine the display value for the pixel,

determining, based on an elevation angle of the viewing ray, which one or more longitudinally adjacent capture images corresponding to the one or more longitudinal image arrays to use to determine the display value for the pixel,

determining, based on the elevation angle of the viewing ray, which one or more pixels from the one or more longitudinally adjacent capture images from the one or more capture images to use to determine the display value for the pixel, and

determining the display value for the pixel based on the display values of each of the one or more pixels.

Applicant respectfully submits that, similar to the discussion above regarding claim 39, Chen does not disclose determining a viewing ray passing through a pixel in a direction of viewing corresponding to a view for each pixel in an image to be rendered as a representation of the view of the surrounding scene as recited in claim 59.

Furthermore, in claim 59 a series of determinations are made based on the viewing ray that is determined for each pixel. As discussed above, however, Chen simply includes a general statement that a user can view different portions of a previously generated panoramic image on a display. Chen does not include any details describing how the values for particular pixels in the display are determined. Applicant respectfully submits that the general statement that a user can view different portions of a previously generated panoramic image on a

display does not provide any specific details of how those different portions can be viewed, much less any description of the various determinations that are made based on the viewing ray as recited in claim 59.

For at least these reasons, Applicant respectfully submits that claim 59 is not anticipated by Chen.

With respect to claims 60-62, given that claims 60-62 depend from claim 59, Applicant respectfully submits that claims 60-62 are likewise allowable over Chen for at least the reasons discussed above with respect to claim 59.

Conclusion

Claims 39-62 are in condition for allowance. Applicant respectfully requests reconsideration and issuance of the subject application. Should any matter in this case remain unresolved, the undersigned attorney respectfully requests a telephone conference with the Examiner to resolve any such outstanding matter.

Respectfully Submitted,

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